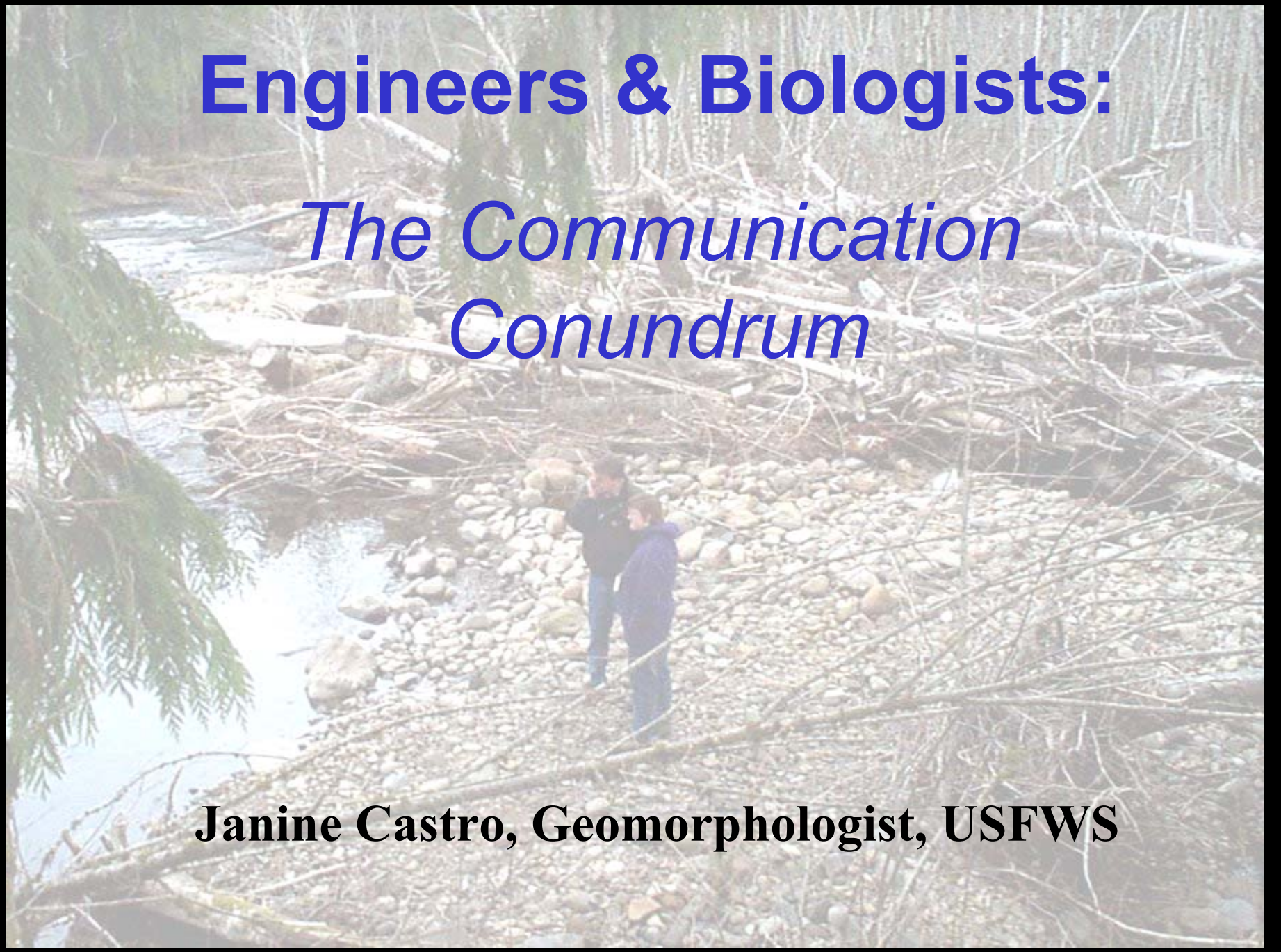
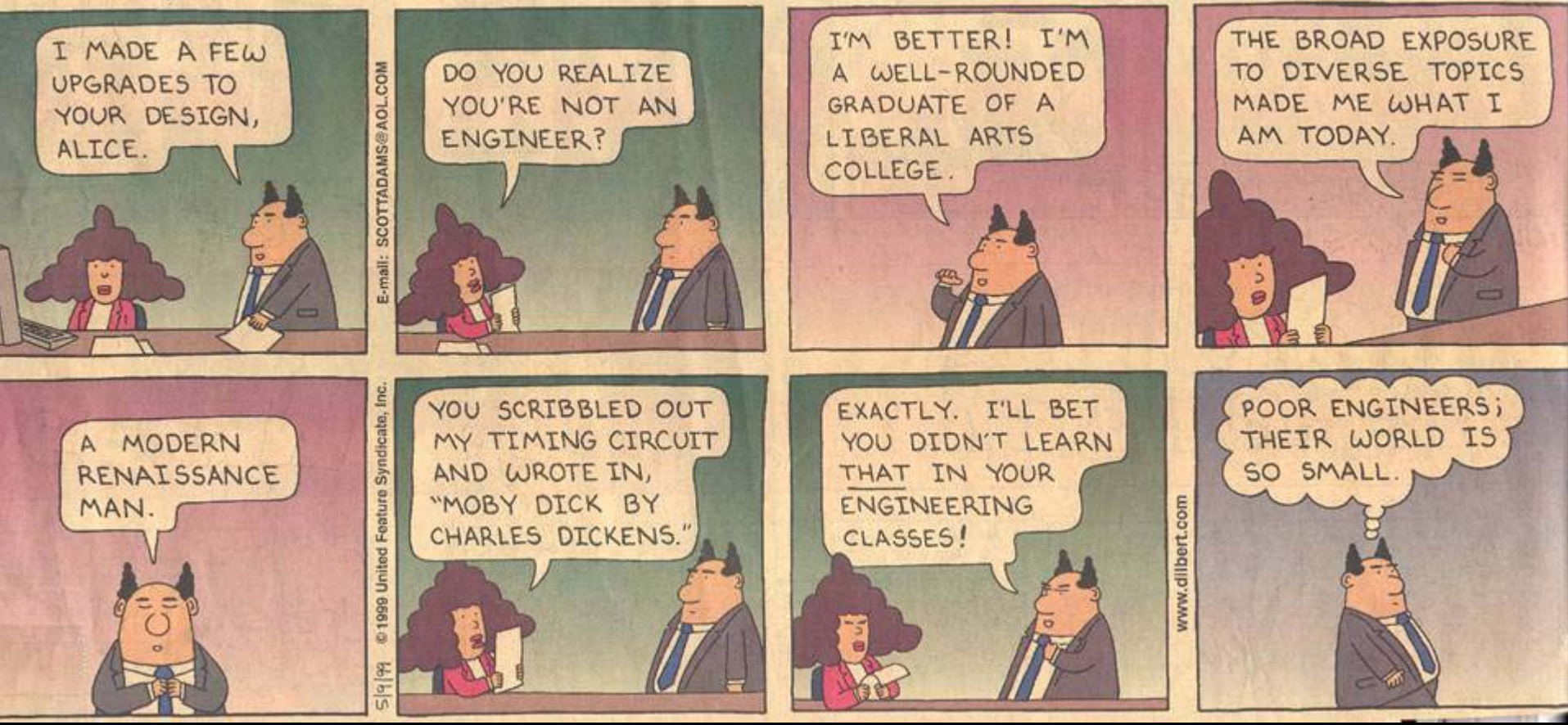
Engineers & Biologists:

The Communication Conundrum



Janine Castro, Geomorphologist, USFWS

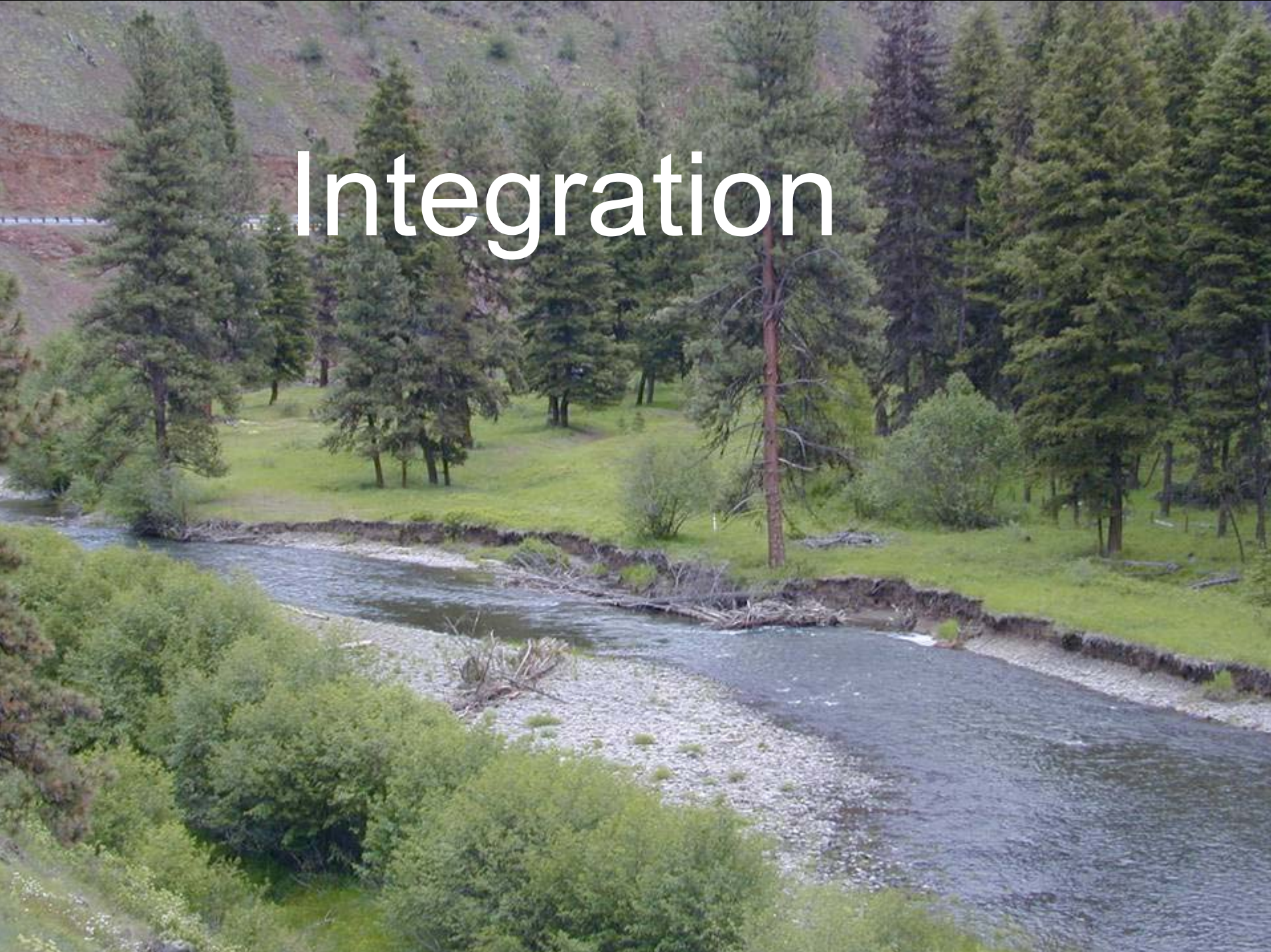
ILBERT®/ by Scott Adams



Past, Present, and Future

Simplification

Accessorization


Integration

Communication

Engineers need… *BUT* Biologists want…

$\mu_{BED} = \tan \phi = \tan 43 = 0.933$
$\theta = \tan^{-1}((\frac{1}{2}D_{RW})/(L_T)) = \tan^{-1}((3)/(20)) = \tan^{-1}(.15) = 8.53°$
$z = (\frac{1}{2}\ D_{RW}) \sin \theta = (3)\sin 8.53° = 0.445$
$\forall_{RW} = \pi\ (D_{RW}/2)^2\ L_{RW}\ \eta_P = (\pi\ 3^2)(3)(0.8) = 67.8\ ft^3$
$\forall_T = (\pi\ r^2)L_T = \pi\ (D_T/2)^2(20) = (3.1416(2/2)^2)(20) = 62.8\ ft^3$
$\forall_{Tsub} = (d_w/\sin\theta)(\pi\ r^2) = (1/\sin 8.53)(3.1416(D_T/2)^2) = (6.7)(3.1416(2/2)^2) = 21.0\ ft^3$
$A_{RWsub} = A_{RW}P_{sub} = \pi\ (D_{RW}/2)^2\ P_{sub} = (3.1416)(9)(0.075) = 2.12\ ft^2$
$\forall_{RWsub} = A_{RWsub}L_{RW} = (2.12)(3) = 6.4\ ft^3$

$F_G = (\forall_T + \forall_{RW})\ \rho_T = (62.8 + 67.8)\ 31.2 = 4075\ \#$

$F_B = (\forall_{Tsub} + \forall_{RWsub})\ \rho_w = (21.0 + 6.4)62.4 = 1710\ \#$

$FS_B = F_G / F_B = 4075 / 1710 = 2.4$ No ballast required

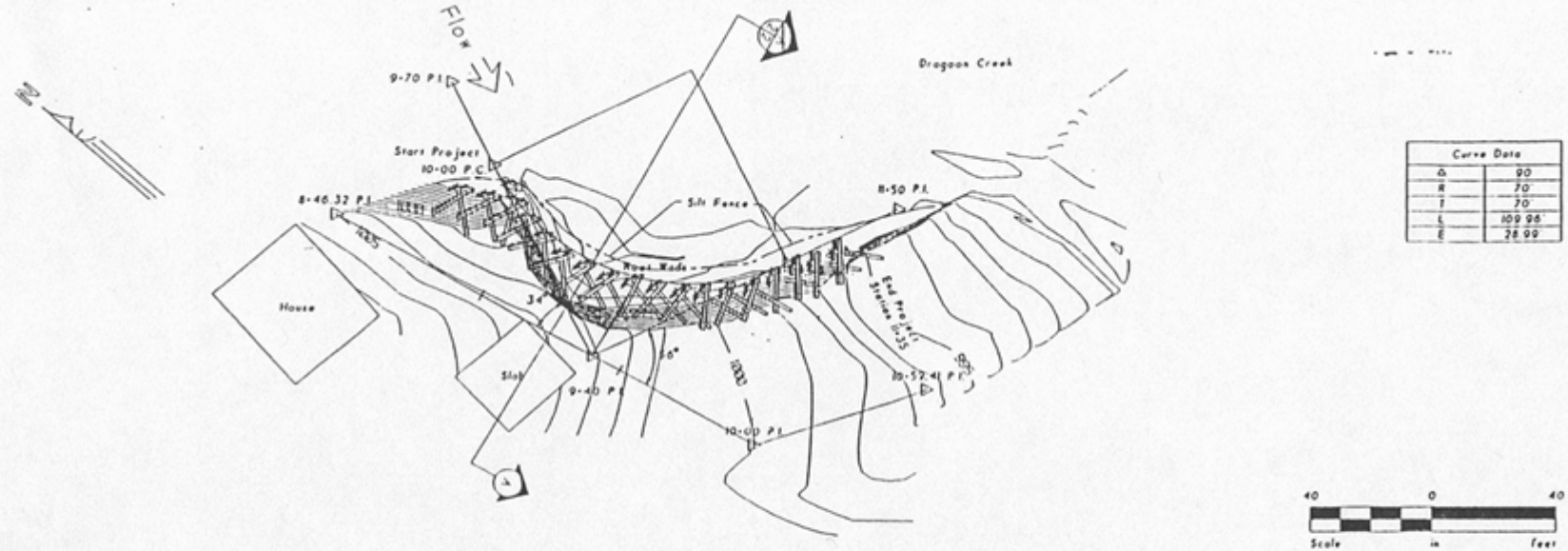
$F_F = (v^2/2g)\ A_{RWsub}\ \rho_w\ C_{DRW} = (5^2/64.4)(2.12)(62.4)(1.2) = 62\ \#$

1. $\Sigma Fy, F_F\ (\sin \theta) + F_G = F_B + F_{NT} + F_{NRW}$
$62(\sin 8.53) + 4075 = 1710 + F_{NT} + F_{NRW}$
$F_{NRW} = 62(\sin 8.53) + 4075 - 1710 - F_{NT}$
$F_{NRW} = 2374 - F_{NT}$

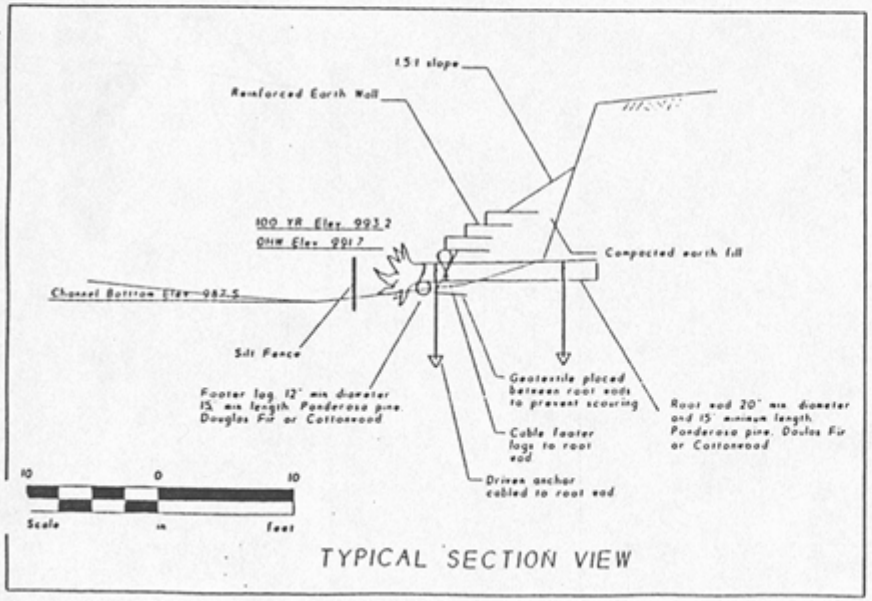
2. $\Sigma Mo, F_{NT}\ (L_T \cos\theta + z) + F_B\ z = F_G\ z + F_F\ (2/3\ d_w)$
$F_{NT}\ (20\cos 8.53 + 0.445) + ((1710)(0.445)) = ((4075)(0.445)) + (62)((2/3)(1))$
$F_{NT}\ (20.22) + (761) = (1813) + (41)$
$F_{NT} = 54\ \#$

$F_{NRW} = 2374 - F_{NT} = 2374 – 54 = 2320\ \#$

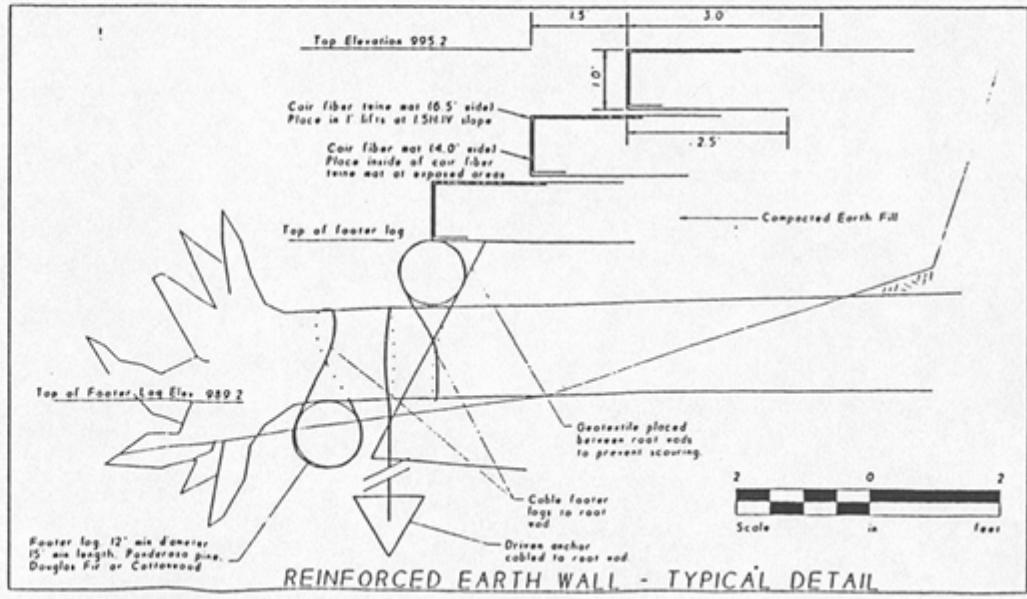
Solve Equation 2. for F_{NT}, substitute into Equation 1. Solve for F_{NRW}



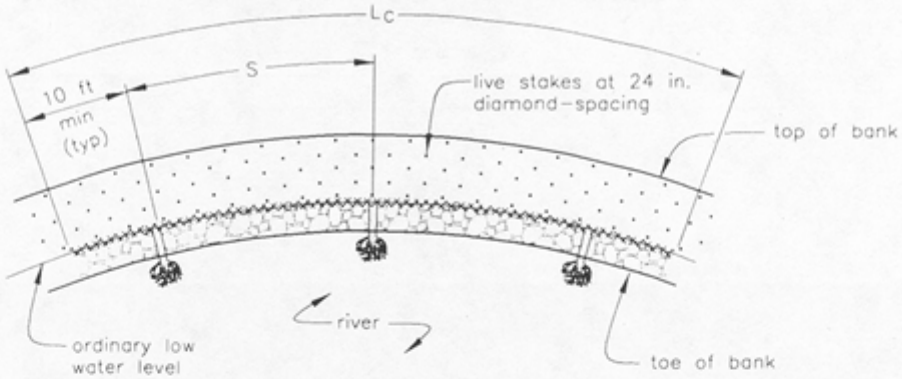
PLAN



TYPICAL SECTION VIEW



REINFORCED EARTH WALL - TYPICAL DETAIL



PLAN VIEW

DIMENSIONS

PROTECTED BANK

L_C = _____ ft.

S = _____ ft.

Z = _____ ft.

H = _____ ft.

L = _____ ft.

LIVE STAKES

Species _____

Length _____

Dia. _____ in.

ROCK RIPRAP

L_R = _____ ft.

H_R = _____ ft.

T_R = _____ ft.

TREE STUMP

Species _____

D_T = _____ ft.

L_T = _____ ft.

B_T = _____ ft.

ROCK GRADATION

ROCK RIPRAP

D_{100} = _____ in.

D_{50} = _____ in.

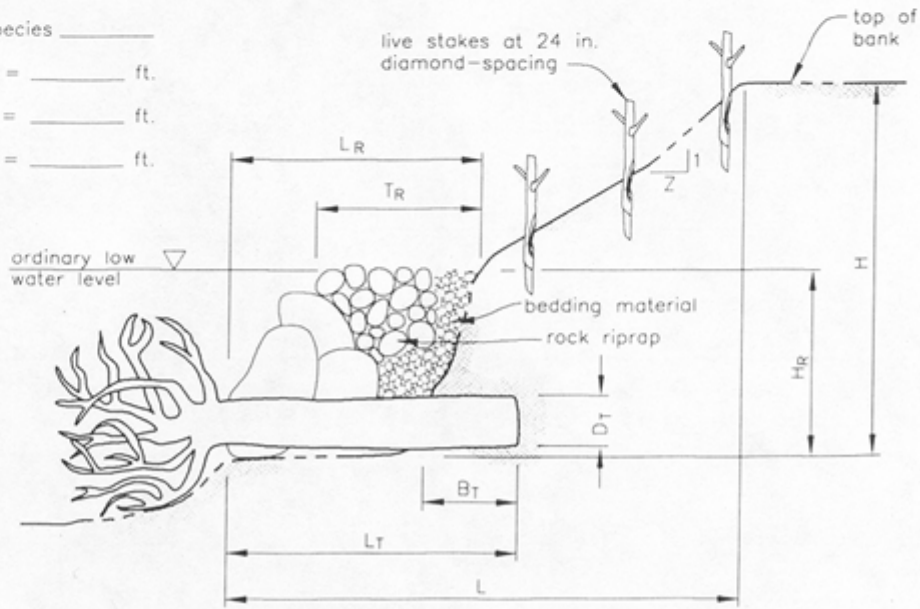
D_{25} = _____ in.

BEDDING MATERIAL

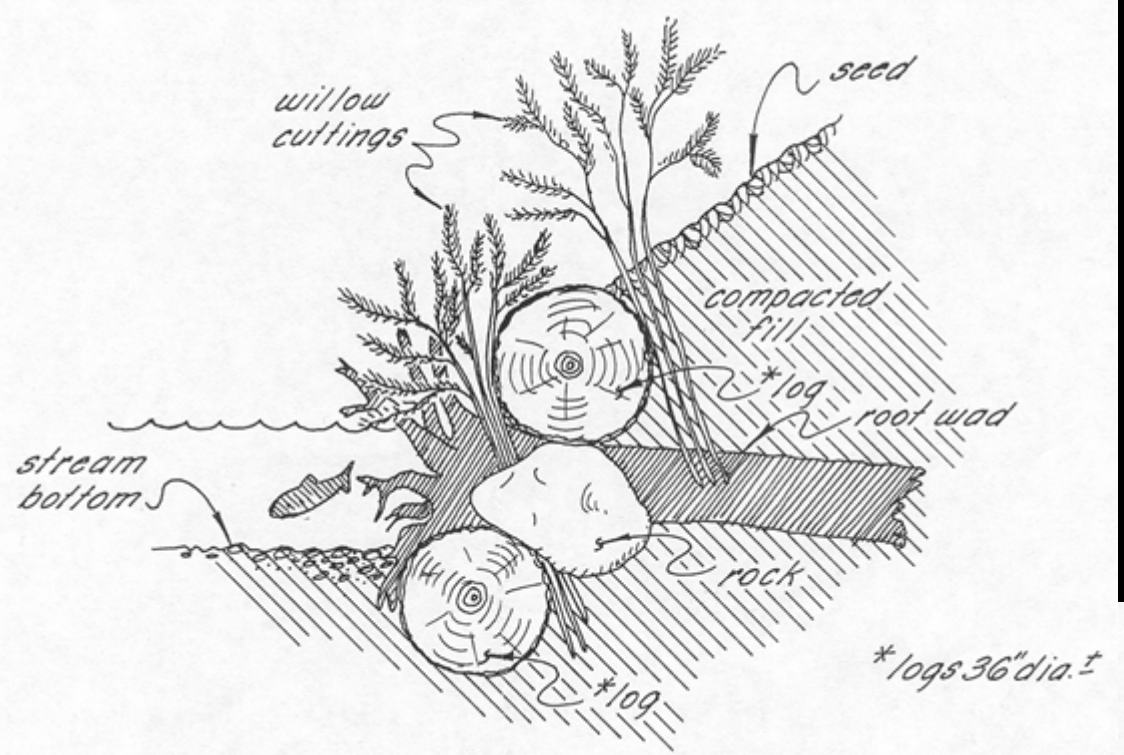
D_{100} = _____ in.

D_{50} = _____ in.

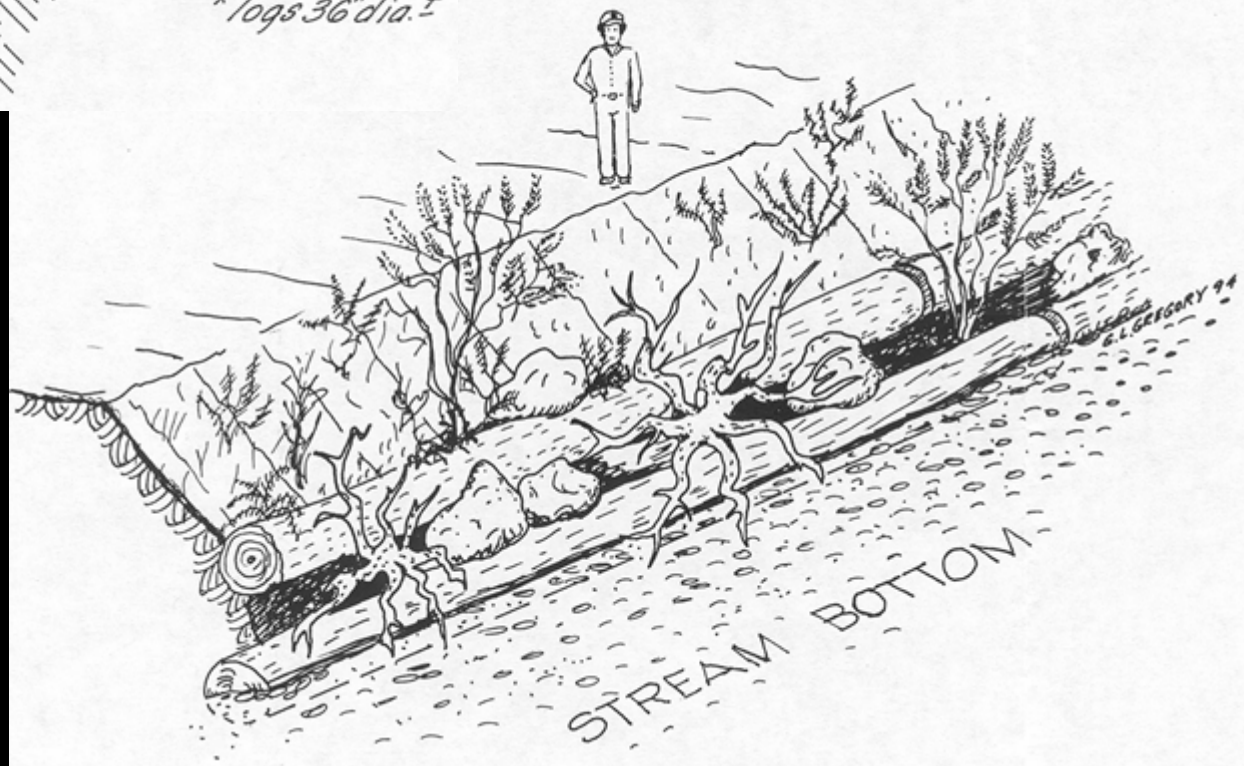
D_{25} = _____ in.

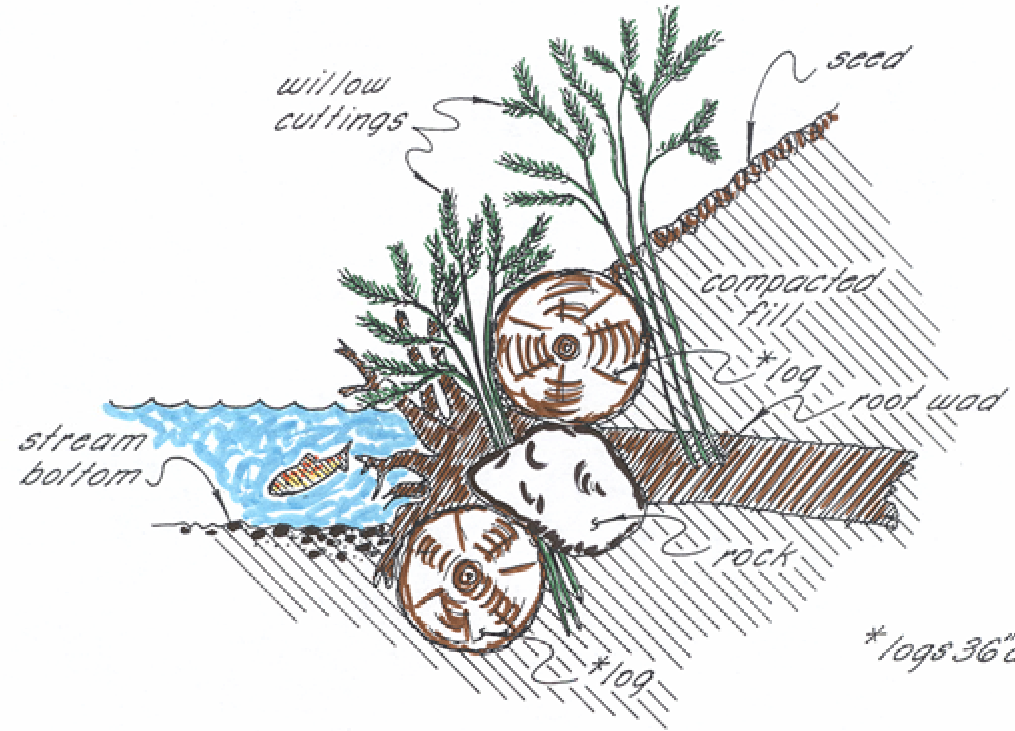


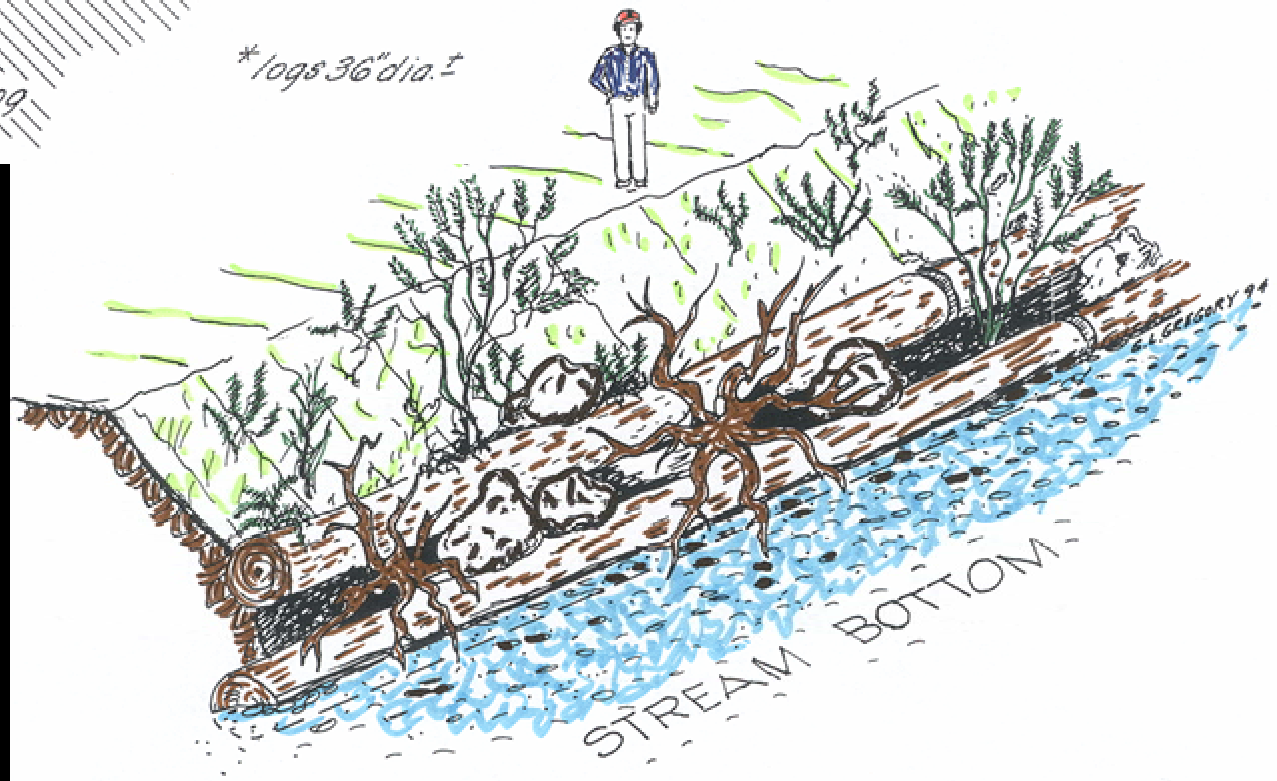
SECTION VIEW

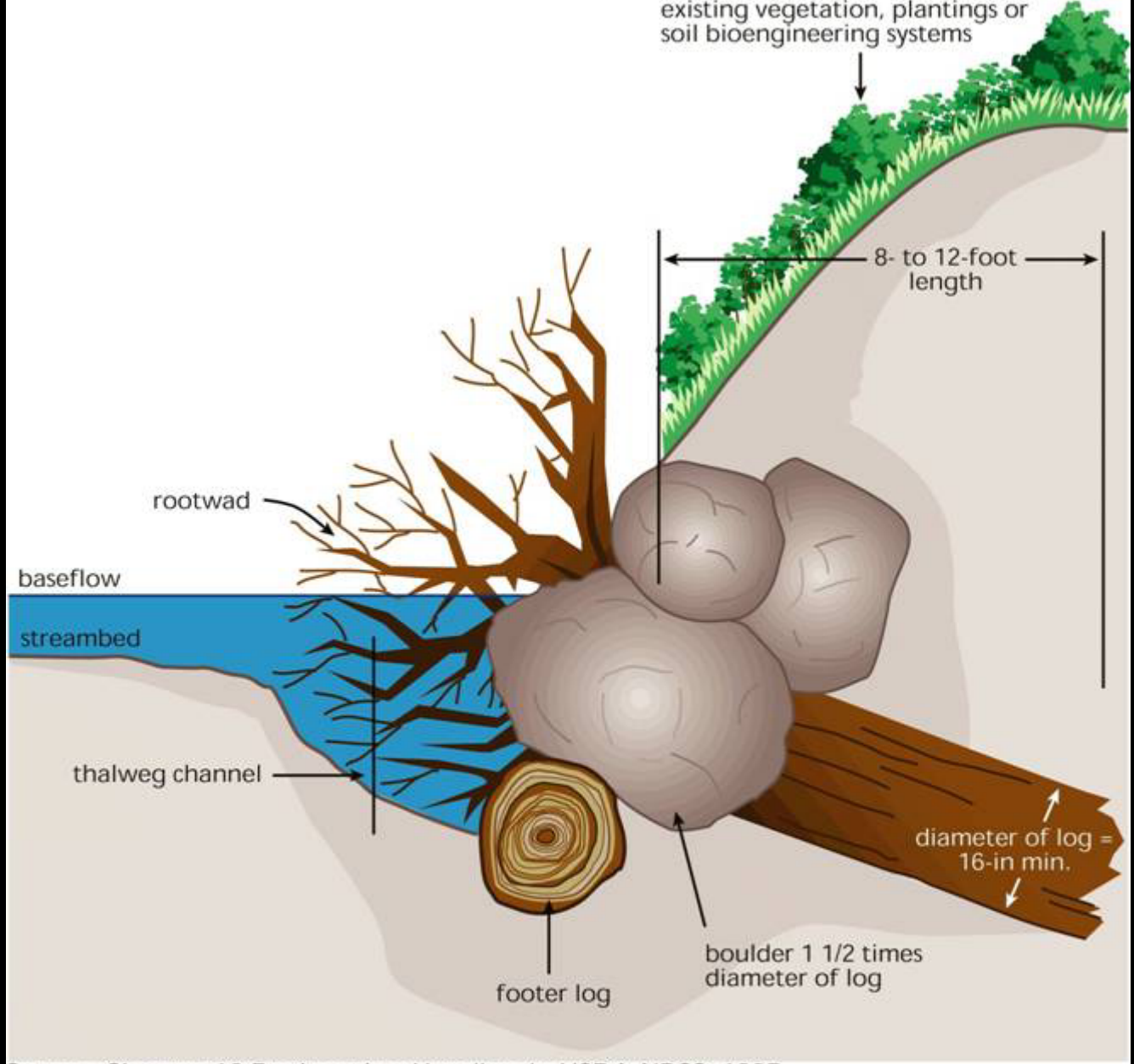

willow cuttings
seed
compacted fill
*log
root wad
stream bottom
rock
*log

*logs 36" dia.±


STREAM BOTTOM
G.L.GREGORY 94


willow cuttings
seed
compacted fill
*log
root wad
stream bottom
rock
*log


*logs 36" dia.±
STREAM BOTTOM
E.L. GREGORY '94



Source: Chapter 16 Engineering Handbook, USDA-NRCS, 1997.

Fig. 8.42 -- Revetment systems. Details of rootwad and boulder technique.
In Stream Corridor Restoration: Principles, Processes, and Practices, 10/98.
Interagency Stream Restoration Working Group (FISRWG)(15 Federal agencies of the US).

Recommendations

- Involve US Fish and Wildlife Service earlier in the process.
- Provide better representation of spatial data.
- Modify engineering drawings to make them clearer and more understandable to non-engineers.
- Follow-up – what recommendations were accepted and helpful?


The
End
© the white planes picture co.